Faculty of Medicine in Rijeka

Curriculum
2024/2025

For course

Medical Physics and Biophysics

Study program:	**Medical Studies in English (R)** University integrated undergraduate and graduate study
Department:	**Department of Medical Physics and Biophysics**
Course coordinator:	**prof. dr. sc. Žauhar Gordana, prof. fizike i kemije**
Year of study:	**1**
ECTS:	**6**
Incentive ECTS:	**0 (0.00%)**
Foreign language:	**Possibility of teaching in a foreign language**

Course information:

Medical Physics and Biophysics is an introductory course, which gives students an insight into the physical principles required for a better understanding of processes in other fields, such as anatomy, biochemistry, physiology, histology, pathology, etc. The purpose of this course is to motivate students to use the analytical and quantitative approach in the research of human body functions.
COURSE STRUCTURE
Lectures: 30 hours
Seminars: 20 hours
Practicals: 25 hours
Total hours: 75

The lectures and practicals will be held at the University Campus on Trsat at the Faculty of Physics (Address: Radmile Matejčić 2, 51000 Rijeka).
During practicals, students will develop abilities and skills in using various measuring devices, which are a part of different medical devices. Upon completing this course, students will be able to collect data, critically evaluate and interpret the results, as well as correctly use the International System of Units and Measurements in medicine.

List of assigned reading:

I.P. Herman. Physics of the Human Body, Springer, Berlin, 2016

List of optional reading:

R. K. Hobbie, B.J. Roth. Intermediate Physics for Medicine and Biology, Springer, New York, 2015

Curriculum:

Lectures list (with titles and explanation):

L1 Introduction. SI Units.

-

L2 Optics in Medicine. Laws of Refraction and Reflection: Image Formation by Plane and Spherical Surfaces of Refraction

-

L3 The Human Eye – the Optical Model

-

L4 Errors of optical systems

-

L5 Image Formation by Lens and Microscope

-

L6 Types of Optical Microscopes. Electron microscopes

-

L7 Fundamental Forces. Statics of the Body. Review of Forces, Torques and Equilibrium

-

L8 Mechanics of the Human Body. Implementation of Newton’s Laws: Levers in the Body, Passive Walking and High Jump.

-

L9 Mechanical Properties of Tissues. Elasticity and Strength of Materials. Viscoelastic Properties of Body Tissues – Mechanical Models.

-

L10 Oscillations and Waves d Waves.

-

L11 Sound Waves: The Physics of Hearing. Intensity of Soun. Connection between Physical and Physiological Parameters of Sound.

-

L12 Fluids. Hydrostatics. Surface Tension and Its Implications. Law of Laplace.

-

L13 Hydrodynamics. Bernoulli's Equation, Viscosity and Poiseuille's Law. Turbulent Flow

-

L14 Rheological Properties of Blood. Physics of the Circulatory System. Consequences of Clogged Arteries

-

L15 Ideal and Real Gases. Gas Laws. Physics of Breathing

-

L16 Basic Principles of Thermodynamics: I and II Law.

-

L17 Thermodynamics of a Biological system. Transfer of Heat.

-

L18 Transfer of Particles and Ions through Membranes. Action Potential.

-

L19 Physical Basis of Electro- and Magneto- Diagnostics (EKG, EEG, EMG).

-

L20 Dielectric Properties of Tissues. Tissues in Electric Field.

-

L21 Therapeutic Applications of Electric Fields.

-

L22 Matter in the External Magnetic Field: A Biological System in the Electric Circuit, Magneto therapy

-

L23 Structure of Atom and Molecule: Molecular Bonds and Energy States

-

L24 Electromagnetic Waves

-

L25 Medical Use of X Rays

-

L26 Structure of the Atomic Nucleus. Nuclear Decay. Decay Rate and Half-life

-

L27 Radioactivity. Alfa, Beta and Gamma Decay.

-

L28 Interaction of Photons with Matter. Detection and Dosimetry of Ionizing Radiation.

-

L29 Application of Ultrasound in Medicine.

-

L30 Final Lecture and Preparation for Final Exam.

-

Seminars list (with titles and explanation):

S1 Calculating Measurement Errors and Estimating Measurement Accuracy

-

S2 Optics

-

S3 Vectors and Operations with Vectors. Graphical Representation of Measurement Results and

Interpretation of Graphs. Differential Calculus.

-

S4 Levers in the Human Body

-

S5 Sound. Hearing and the Ear.

-

S6 Hydromechanics

-

S7 Physics of Breathing

-

S8 Diffusion and Osmosis. Transport of Energy and Matter through Cell Membranes

-

S9 Medical Use of X-Rays

-

S10 Application of Radioactive Isotopes in Nuclear Medicine

-

Practicals list (with titles and explanation):

P0 Introduction to Practicals. General Laboratory Safety Procedures and Rules.

-

P1 Mechanical Waves

-

P2 Audiometry

-

P3 Surface Tension and Viscosity

-

P4 Calorimetry

-

P5 Thermal Environmental Conditions

-

P6 Index of Refraction. Spectroscopy

-

P7 Spherical Mirrors and Lenses

-

P8 Electric Circuits

-

P9 Measurement of Resistance. The Wheatstone Bridge Method

-

P10 Ionizing radiation

-

P11 Compensation

-

P12 Compensation

-

Student obligations:

The attendance at lectures, seminars and practicals is mandatory. If necessary, a student can be absent from 30% of the classes of the overall course workload but has to make up for the practicals he/she failed to attend. Students' obligations are course attendance and active participation in all practicals and seminars.

Throughout the course, students have two midterm exams (tests) consisting of 14 questions each.
Test 1 covers the topics presented in seminars 1-5.
Test 2 covers the topics presented in seminars 6-10.

The completion and proper documentation of each practical as well as the consent of the course instructor are required for course completion.

Evaluation of students' work:
Students can obtain a total of 100 credits (a maximum of 50 credits during the course and a maximum of 50 credits on the final exam). Students are allowed to take the final exam if they acquire a minimum of 25 credits during the semester.
Students who did not gain 50% on each midterm exam may retake their midterm exams. A student can repeat the mid-term exam a maximum of two times, and if he/she still does not pass it, he/she must re-enrol for the course.

On the final exam, students can obtain a maximum of 50 credits. The final exam is oral.

Exam (exam taking, description of the written/oral/practical part of the exam, point distribution, grading criteria):

Assessment (exams, description of written / oral / practical exam, the scoring criteria):

	Assessment	Grade Point Maximum
Midterm Exams	Midterm 1 (14 questions)	14
	Midterm 2 (14 questions)	14
	total	**28**
Practicals	Accepted practicals and reports 10 x 5 x 0.4 credits	20
	total	**48**
Active participation	Active participation during seminars	**2**
TOTAL		**50**
Final exam	Oral part	50
	total	**50**
TOTAL		**100**

Partial exams:
Two midterm exams are scheduled during the trimester.
1. Midterm exam. 14 questions
2. Midterm exam. 14 questions

Practicals:
Throughout 10 practicals a student can obtain a maximum of 20 credits.
Each completed and accepted practical is assessed. A student may miss a maximum of two practicals, which he/she must make up in order to fulfil the requirements for taking the final exam.

Active participation during seminars:
During the trimester student participation and dedication will be monitored. A maximum of 2 points is awarded through active participation.

Final exam:

The final exam is oral.

Assessment of the oral part of the final exam:

Grade on oral exam	Credits
sufficient	10-20

good	21-30
very good	31-40
excellent	41-50

Assessment of the oral part of the final exam:

Grade on oral exam	Credits
sufficient	10-20
good	21-30
very good	31-40
excellent	41-50

The ECTS grading system is defined by the following criteria:

A (5) – 90 - 100 credits

B (4) – 75 - 89,9 credits

C (3) – 60 - 74,9 credits

D (2) – 50 - 59,9 credits

Other notes (related to the course) important for students:

Retaking the course: A student who acquires less than 25 credits during the course has failed the course, is graded with F, and must retake the course MEDICAL PHYSICS AND BIOPHYSICS.

COURSE HOURS 2024/2025

Medical Physics and Biophysics

Lectures (Place and time or group)	**Practicals** (Place and time or group)	**Seminars** (Place and time or group)
05.03.2025		

L1 Introduction. SI Units.:
• Campus O-029 (08:15 - 10:00) [149]
  ○ MPBP
 	
L2 Optics in Medicine. Laws of Refraction and Reflection: Image Formation by Plane and Spherical Surfaces of Refraction:
• Campus O-029 (08:15 - 10:00) [149]
  ○ MPBP		

prof. dr. sc. Žauhar Gordana, prof. fizike i kemije [149]		
12.03.2025		

L3 The Human Eye – the Optical Model:
• Campus O-029 (08:15 - 10:00) [149]
  ○ MPBP
 	
L4 Errors of optical systems:
• Campus O-029 (08:15 - 10:00) [149]
  ○ MPBP
	P0 Introduction to Practicals. General Laboratory Safety Procedures and Rules.:
	• Campus O-162 (10:00 - 11:00) [457] [1458] [2812]
	  ○ MPBP P A
	• Campus O-162 (12:00 - 13:00) [337] [1458] [2812]
	  ○ MPBP V B
	• Campus O-162 (13:00 - 14:00) [337] [1458] [2812]
	  ○ MPBP P C
		S1 Calculating Measurement Errors and Estimating Measurement Accuracy:
		• Campus O-152 (10:15 - 12:00) [149]
		  ○ MPBP S B

Majetić Marijana, viša laborantica [1458] · Musulin Marija, viša laborantica [2812] · Pribanić Ivan, mag. edu. phys. et math. [457] · doc.dr. sc. Čargonja Marija [337] · prof. dr. sc. Žauhar Gordana, prof. fizike i kemije [149]		
14.03.2025		
		S1 Calculating Measurement Errors and Estimating Measurement Accuracy: • P08 (09:15 - 11:00) [149] ○ MPBP S A
prof. dr. sc. Žauhar Gordana, prof. fizike i kemije [149]		
19.03.2025		

L5 Image Formation by Lens and Microscope:
• Campus O-029 (08:15 - 10:00) [149]
  ○ MPBP
 	
L6 Types of Optical Microscopes. Electron microscopes:
• Campus O-029 (08:15 - 10:00) [149]
  ○ MPBP
	P1 Mechanical Waves:
	• Campus O-162 (10:00 - 12:00) [457] [1458] [2812]
	  ○ MPBP P A
	• Campus O-162 (12:00 - 14:00) [337] [1458] [2812]
	  ○ MPBP V B
	• Campus O-162 (14:00 - 16:00) [337] [1458] [2812]
	  ○ MPBP P C
		S2 Optics:
		• Campus O-152 (10:15 - 12:00) [149]
		  ○ MPBP S B

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21.03.2025		

		S2 Optics: • P06 (09:15 - 11:00) [149] ○ MPBP S A
prof. dr. sc. Žauhar Gordana, prof. fizike i kemije [149]		
26.03.2025		

	P2 Audiometry:
	• Campus O-162 (10:00 - 12:00) [457] [1458] [2812]
	  ○ MPBP P A
	• Campus O-162 (12:00 - 14:00) [337] [1458] [2812]
	  ○ MPBP V B
	• Campus O-162 (14:00 - 16:00) [337] [1458] [2812]
	  ○ MPBP P C
		S3 Vectors and Operations with Vectors. Graphical Representation of Measurement Results and Interpretation of Graphs. Differential Calculus.:
		• Campus O-152 (10:15 - 12:00) [149]
		  ○ MPBP S B

Majetić Marijana, viša laborantica [1458] · Musulin Marija, viša laborantica [2812] · Pribanić Ivan, mag. edu. phys. et math. [457] · doc.dr. sc. Čargonja Marija [337] · prof. dr. sc. Žauhar Gordana, prof. fizike i kemije [149]		
28.03.2025		
		S3 Vectors and Operations with Vectors. Graphical Representation of Measurement Results and Interpretation of Graphs. Differential Calculus.: • v (09:15 - 11:00) [149] ○ MPBP S A
prof. dr. sc. Žauhar Gordana, prof. fizike i kemije [149]		
02.04.2025		

L7 Fundamental Forces. Statics of the Body. Review of Forces, Torques and Equilibrium:
• Campus O-029 (08:15 - 11:00) [2300]
  ○ MPBP
 	
L8 Mechanics of the Human Body. Implementation of Newton’s Laws: Levers in the Body, Passive Walking and High Jump.:
• Campus O-029 (08:15 - 11:00) [2300]
  ○ MPBP
 	
L9 Mechanical Properties of Tissues. Elasticity and Strength of Materials. Viscoelastic Properties of Body Tissues – Mechanical Models.:
• Campus O-029 (08:15 - 11:00) [2300]
  ○ MPBP
	P3 Surface Tension and Viscosity:
	• Campus O-162 (11:00 - 13:00) [457] [1458] [2812]
	  ○ MPBP P A
	• Campus O-162 (13:00 - 15:00) [337] [1458] [2812]
	  ○ MPBP V B
	• Campus O-162 (15:00 - 17:00) [337] [1458] [2812]
	  ○ MPBP P C
		S4 Levers in the Human Body:
		• Campus O-152 (11:15 - 13:00) [149]
		  ○ MPBP S B

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04.04.2025		
		S4 Levers in the Human Body: • P08 (09:15 - 11:00) [149] ○ MPBP S A
prof. dr. sc. Žauhar Gordana, prof. fizike i kemije [149]		
09.04.2025		

L10 Oscillations and Waves d Waves.:
• Campus O-029 (08:15 - 10:00) [149]
  ○ MPBP
 	
L11 Sound Waves: The Physics of Hearing. Intensity of Soun. Connection between Physical and Physiological Parameters of Sound.:
• Campus O-029 (08:15 - 10:00) [149]
  ○ MPBP
	P4 Calorimetry:
	• Campus O-162 (10:00 - 12:00) [457] [1458] [2812]
	  ○ MPBP P A
	• Campus O-162 (12:00 - 14:00) [337] [1458] [2812]
	  ○ MPBP V B
	• Campus O-162 (14:00 - 16:00) [337] [1458] [2812]
	  ○ MPBP P C
		S5 Sound. Hearing and the Ear.:
		• Campus O-152 (10:15 - 12:00) [149]
		  ○ MPBP S B

Majetić Marijana, viša laborantica [1458] · Musulin Marija, viša laborantica [2812] · Pribanić Ivan, mag. edu. phys. et math. [457] · doc.dr. sc. Čargonja Marija [337] · prof. dr. sc. Žauhar Gordana, prof. fizike i kemije [149]		
11.04.2025		
		S5 Sound. Hearing and the Ear.: • P06 (09:15 - 11:00) [149] ○ MPBP S A
prof. dr. sc. Žauhar Gordana, prof. fizike i kemije [149]		
16.04.2025		

L12 Fluids. Hydrostatics. Surface Tension and Its Implications. Law of Laplace.:
• Campus O-029 (08:15 - 11:00) [2300]
  ○ MPBP
 	
L13 Hydrodynamics. Bernoulli's Equation, Viscosity and Poiseuille's Law. Turbulent Flow:
• Campus O-029 (08:15 - 11:00) [2300]
  ○ MPBP
 	
L14 Rheological Properties of Blood. Physics of the Circulatory System. Consequences of Clogged Arteries:
• Campus O-029 (08:15 - 11:00) [2300]
  ○ MPBP
	P5 Thermal Environmental Conditions:
	• Campus O-162 (11:00 - 13:00) [457] [1458] [2812]
	  ○ MPBP P A
	• Campus O-162 (13:00 - 15:00) [337] [1458] [2812]
	  ○ MPBP V B
	• Campus O-162 (15:00 - 17:00) [337] [1458] [2812]
	  ○ MPBP P C	

Majetić Marijana, viša laborantica [1458] · Musulin Marija, viša laborantica [2812] · Pribanić Ivan, mag. edu. phys. et math. [457] · doc.dr. sc. Čargonja Marija [337] · prof. dr. sc. Žuvić Marta, prof. matematike i fizike [2300]		
23.04.2025		

L15 Ideal and Real Gases. Gas Laws. Physics of Breathing:
• Campus O-029 (08:15 - 10:00) [2300]
  ○ MPBP
 	
L16 Basic Principles of Thermodynamics: I and II Law.:
• Campus O-029 (08:15 - 10:00) [2300]
  ○ MPBP
	P6 Index of Refraction. Spectroscopy:
	• Campus O-162 (10:00 - 12:00) [457] [1458] [2812]
	  ○ MPBP P A
	• Campus O-162 (12:00 - 14:00) [337] [1458] [2812]
	  ○ MPBP V B
	• Campus O-162 (14:00 - 16:00) [337] [1458] [2812]
	  ○ MPBP P C	

Majetić Marijana, viša laborantica [1458] · Musulin Marija, viša laborantica [2812] · Pribanić Ivan, mag. edu. phys. et math. [457] · doc.dr. sc. Čargonja Marija [337] · prof. dr. sc. Žuvić Marta, prof. matematike i fizike [2300]		
30.04.2025		

L17 Thermodynamics of a Biological system. Transfer of Heat.:
• Campus O-029 (08:15 - 10:00) [2300]
  ○ MPBP
 	
L18 Transfer of Particles and Ions through Membranes. Action Potential.:
• Campus O-029 (08:15 - 10:00) [2300]
  ○ MPBP
	P7 Spherical Mirrors and Lenses:
	• Campus O-162 (10:00 - 12:00) [457] [1458] [2812]
	  ○ MPBP P A
	• Campus O-162 (12:00 - 14:00) [337] [1458] [2812]
	  ○ MPBP V B
	• Campus O-162 (14:00 - 16:00) [337] [1458] [2812]
	  ○ MPBP P C
		S6 Hydromechanics:
		• Campus O-029 (10:15 - 12:00) [149]
		  ○ MPBP S B
		• Campus O-029 (12:15 - 14:00) [149]
		  ○ MPBP S A

Majetić Marijana, viša laborantica [1458] · Musulin Marija, viša laborantica [2812] · Pribanić Ivan, mag. edu. phys. et math. [457] · doc.dr. sc. Čargonja Marija [337] · prof. dr. sc. Žauhar Gordana, prof. fizike i kemije [149] · prof. dr. sc. Žuvić Marta, prof. matematike i fizike [2300]		
07.05.2025		

L19 Physical Basis of Electro- and Magneto-Diagnostics (EKG, EEG, EMG).:
• Campus O-029 (08:15 - 10:00) [2300]
  ○ MPBP
 	
L20 Dielectric Properties of Tissues. Tissues in Electric Field.:
• Campus O-029 (08:15 - 10:00) [2300]
  ○ MPBP
	P8 Electric Circuits:
	• Campus O-162 (10:00 - 12:00) [457] [1458] [2812]
	  ○ MPBP P A
	• Campus O-162 (12:00 - 14:00) [337] [1458] [2812]
	  ○ MPBP V B
	• Campus O-162 (14:00 - 16:00) [337] [1458] [2812]
	  ○ MPBP P C
		S7 Physics of Breathing:
		• Campus O-029 (10:15 - 12:00) [149]
		  ○ MPBP S B
		• Campus O-152 (12:15 - 14:00) [149]
		  ○ MPBP S A

Majetić Marijana, viša laborantica [1458] · Musulin Marija, viša laborantica [2812] · Pribanić Ivan, mag. edu. phys. et math. [457] · doc.dr. sc. Čargonja Marija [337] · prof. dr. sc. Žauhar Gordana, prof. fizike i kemije [149] · prof. dr. sc. Žuvić Marta, prof. matematike i fizike [2300]		
14.05.2025		

L21 Therapeutic Applications of Electric Fields.:
• Campus O-029 (08:15 - 10:00) [2300]
  ○ MPBP
 	
L22 Matter in the External Magnetic Field: A Biological System in the Electric Circuit, Magneto therapy:
• Campus O-029 (08:15 - 10:00) [2300]
  ○ MPBP
	P9 Measurement of Resistance. The Wheatstone Bridge Method:
	• Campus O-162 (10:00 - 12:00) [457] [1458] [2812]
	  ○ MPBP P A
	• Campus O-162 (12:00 - 14:00) [337] [1458] [2812]
	  ○ MPBP V B
	• Campus O-162 (14:00 - 16:00) [337] [1458] [2812]
	  ○ MPBP P C
		S8 Diffusion and Osmosis. Transport of Energy and Matter through Cell Membranes:
		• Campus O-152 (10:15 - 12:00) [149]
		  ○ MPBP S B

Majetić Marijana, viša laborantica [1458] · Musulin Marija, viša laborantica [2812] · Pribanić Ivan, mag. edu. phys. et math. [457] · doc.dr. sc. Čargonja Marija [337] · prof. dr. sc. Žauhar Gordana, prof. fizike i kemije [149] · prof. dr. sc. Žuvić Marta, prof. matematike i fizike [2300]		
16.05.2025		
		S8 Diffusion and Osmosis. Transport of Energy and Matter through Cell Membranes: • P09 - TEACHING IN ENGLISH (09:15 - 11:00) [149] ○ MPBP S A
prof. dr. sc. Žauhar Gordana, prof. fizike i kemije [149]		
21.05.2025		

L23 Structure of Atom and Molecule: Molecular Bonds and Energy States: • Campus O-029 (08:15 - 10:00) [252] ◦ MPBP L24 Electromagnetic Waves: • Campus O-029 (08:15 - 10:00) [252] ◦ MPBP	P10 Ionizing radiation: • Campus O-162 (10:00 - 12:00) [457] [1458] [2812] ◦ MPBP P A • Campus O-162 (12:00 - 14:00) [337] [1458] [2812] ◦ MPBP V B • Campus O-162 (14:00 - 16:00) [337] [1458] [2812] ◦ MPBP P C	S9 Medical Use of X-Rays: • Campus O-152 (10:15 - 12:00) [252] ◦ MPBP S B • Campus O-152 (12:00 - 14:00) [252] ◦ MPBP S A
prof. dr. sc. Jurković Slaven, spec. med. fiz. [252] · Majetić Marijana, viša laborantica [1458] · Musulin Marija, viša laborantica [2812] · Pribanić Ivan, mag. edu. phys. et math. [457] · doc.dr. sc. Čargonja Marija [337]		
28.05.2025		
L25 Medical Use of X Rays: • Campus O-029 (08:15 - 10:00) [252] ◦ MPBP L26 Structure of the Atomic Nucleus. Nuclear Decay. Decay Rate and Half-life: • Campus O-029 (08:15 - 10:00) [252] ◦ MPBP	P11 Compensation: • Campus O-162 (10:00 - 12:00) [457] [1458] [2812] ◦ MPBP P A • Campus O-162 (12:00 - 14:00) [337] [1458] [2812] ◦ MPBP P C • Campus O-162 (14:00 - 16:00) [337] [1458] [2812] ◦ MPBP V B	S10 Application of Radioactive Isotopes in Nuclear Medicine: • Campus O-152 (10:15 - 12:00) [252] ◦ MPBP S B • Campus O-152 (12:15 - 14:00) [252] ◦ MPBP S A
prof. dr. sc. Jurković Slaven, spec. med. fiz. [252] · Majetić Marijana, viša laborantica [1458] · Musulin Marija, viša laborantica [2812] · Pribanić Ivan, mag. edu. phys. et math. [457] · doc.dr. sc. Čargonja Marija [337]		
04.06.2025		
L27 Radioactivity. Alfa, Beta and Gamma Decay.: • Campus O-029 (08:15 - 10:00) [252] ◦ MPBP L28 Interaction of Photons with Matter. Detection and Dosimetry of Ionizing Radiation.: • Campus O-029 (08:15 - 10:00) [252] ◦ MPBP	P12 Compensation: • Campus O-162 (10:00 - 12:00) [457] [1458] [2812] ◦ MPBP P A • Campus O-162 (12:00 - 14:00) [337] [1458] [2812] ◦ MPBP V B • Campus O-162 (14:00 - 16:00) [337] [1458] [2812] ◦ MPBP P C	
prof. dr. sc. Jurković Slaven, spec. med. fiz. [252] · Majetić Marijana, viša laborantica [1458] · Musulin Marija, viša laborantica [2812] · Pribanić Ivan, mag. edu. phys. et math. [457] · doc.dr. sc. Čargonja Marija [337]		
11.06.2025		
L29 Application of Ultrasound in Medicine.: • Campus O-029 (08:15 - 10:00) [149] ◦ MPBP L30 Final Lecture and Preparation for Final Exam.: • Campus O-029 (08:15 - 10:00) [149] ◦ MPBP		
prof. dr. sc. Žauhar Gordana, prof. fizike i kemije [149]		

List of lectures, seminars and practicals:

LECTURES (TOPIC)	Number of hours	Location
L1 Introduction. SI Units.	1	Campus O-029

L2 Optics in Medicine. Laws of Refraction and Reflection: Image Formation by Plane and Spherical Surfaces of Refraction	1	Campus O-029
L3 The Human Eye – the Optical Model	1	Campus O-029
L4 Errors of optical systems	1	Campus O-029
L5 Image Formation by Lens and Microscope	1	Campus O-029
L6 Types of Optical Microscopes. Electron microscopes	1	Campus O-029
L7 Fundamental Forces. Statics of the Body. Review of Forces, Torques and Equilibrium	1	Campus O-029
L8 Mechanics of the Human Body. Implementation of Newton’s Laws: Levers in the Body, Passive Walking and High Jump.	1	Campus O-029
L9 Mechanical Properties of Tissues. Elasticity and Strength of Materials. Viscoelastic Properties of Body Tissues – Mechanical Models.	1	Campus O-029
L10 Oscillations and Waves d Waves.	1	Campus O-029
L11 Sound Waves: The Physics of Hearing. Intensity of Soun. Connection between Physical and Physiological Parameters of Sound.	1	Campus O-029
L12 Fluids. Hydrostatics. Surface Tension and Its Implications. Law of Laplace.	1	Campus O-029
L13 Hydrodynamics. Bernoulli's Equation, Viscosity and Poiseuille's Law. Turbulent Flow	1	Campus O-029
L14 Rheological Properties of Blood. Physics of the Circulatory System. Consequences of Clogged Arteries	1	Campus O-029
L15 Ideal and Real Gases. Gas Laws. Physics of Breathing	1	Campus O-029
L16 Basic Principles of Thermodynamics: I and II Law.	1	Campus O-029
L17 Thermodynamics of a Biological system. Transfer of Heat.	1	Campus O-029
L18 Transfer of Particles and Ions through Membranes. Action Potential.	1	Campus O-029
L19 Physical Basis of Electro- and Magneto- Diagnostics (EKG, EEG, EMG).	1	Campus O-029
L20 Dielectric Properties of Tissues. Tissues in Electric Field.	1	Campus O-029
L21 Therapeutic Applications of Electric Fields.	1	Campus O-029
L22 Matter in the External Magnetic Field: A Biological System in the Electric Circuit, Magneto therapy	1	Campus O-029
L23 Structure of Atom and Molecule: Molecular Bonds and Energy States	1	Campus O-029
L24 Electromagnetic Waves	1	Campus O-029
L25 Medical Use of X Rays	1	Campus O-029
L26 Structure of the Atomic Nucleus. Nuclear Decay. Decay Rate and Half-life	1	Campus O-029
L27 Radioactivity. Alfa, Beta and Gamma Decay.	1	Campus O-029
L28 Interaction of Photons with Matter. Detection and Dosimetry of Ionizing Radiation.	1	Campus O-029
L29 Application of Ultrasound in Medicine.	1	Campus O-029
L30 Final Lecture and Preparation for Final Exam.	1	Campus O-029

PRACTICALS (TOPIC)	Number of hours	Location

P0 Introduction to Practicals. General Laboratory Safety Procedures and Rules.	1	Campus O-162
P1 Mechanical Waves	2	Campus O-162
P2 Audiometry	2	Campus O-162
P3 Surface Tension and Viscosity	2	Campus O-162
P4 Calorimetry	2	Campus O-162
P5 Thermal Environmental Conditions	2	Campus O-162
P6 Index of Refraction. Spectroscopy	2	Campus O-162
P7 Spherical Mirrors and Lenses	2	Campus O-162
P8 Electric Circuits	2	Campus O-162
P9 Measurement of Resistance. The Wheatstone Bridge Method	2	Campus O-162
P10 Ionizing radiation	2	Campus O-162
P11 Compensation	2	Campus O-162
P12 Compensation	2	Campus O-162

SEMINARS (TOPIC)	Number of hours	Location
S1 Calculating Measurement Errors and Estimating Measurement Accuracy	2	Campus O-152 P08
S2 Optics	2	Campus O-152 P06
S3 Vectors and Operations with Vectors. Graphical Representation of Measurement Results and Interpretation of Graphs. Differential Calculus.	2	Campus O-152 v
S4 Levers in the Human Body	2	Campus O-152 P08
S5 Sound. Hearing and the Ear.	2	Campus O-152 P06
S6 Hydromechanics	2	Campus O-029
S7 Physics of Breathing	2	Campus O-029 Campus O-152
S8 Diffusion and Osmosis. Transport of Energy and Matter through Cell Membranes	2	Campus O-152 P09 - TEACHING IN ENGLISH
S9 Medical Use of X-Rays	2	Campus O-152
S10 Application of Radioactive Isotopes in Nuclear Medicine	2	Campus O-152

EXAM DATES (final exam):

1.	16.06.2025.
2.	30.06.2025.
3.	14.07.2025.
4.	04.09.2025.
5.	18.09.2025.